

WHAT IS CLAIMED IS:

1. A communication system for carrying out data communication among a plurality of communication stations comprising:

- 5 a first communication station for transmitting to other communication stations a request to send signal for requesting a transmission upon the start of the data transmission; and  
a plurality of second communication stations transmitting to other communication stations a clear to send  
10 signal for notifying the completion of preparing the reception, wherein;

said first communication station transmits the request to send signal describing at least each of addresses said second communication stations that are desired to receive the  
15 data, and receives a plurality of the clear to send signals transmitted from each of said second communication stations.

2. The communication system as cited in claim 1, wherein:

said first communication station has a plurality of  
20 antenna elements for a directive antenna;

each of said plurality of second communication stations transmit clear to send signal describing at least reference information known to said first communication station; and

said first communication station learns weightings for  
25 the directive antenna on the basis of the reference information in the clear to send signals transmitted from said plurality of second communication stations.

3. The communication system as cited in claim 2, wherein:

30 said first communication station transmits data by the space division multiplexing to each of said second

communication stations using said plurality of antenna elements when receiving the clear to send signal transmitted from each of said plurality of second communication stations; and

5        each of said plurality of second communication stations transmits a response signal which is used to notify that the transmitted data to other stations is correctly received, describes at least second reference information known to said first communication station, and is inherent to said plurality  
10 of second communication stations when receiving the data transmitted from said first communication station.

4.        The communication system as cited in claim 1, wherein:  
          each of said plurality of second communication stations  
15 transmits the clear to send signals describing self address.

5.        The communication system as cited in claim 1, wherein:  
          each said plurality of second communication stations time-divisionally transmits the clear to send signals.

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6.        The communication system as cited in claim 1, wherein:  
          the clear to send signal is formed to have generally two sections in which a first section describes at least an interval where a third communication station the address of  
25 which is not described in the request to send signal transmitted from said first communication station must stop its communication operation, and a second section describes at least reference information known to said first communication station; and

30        each of said plurality of second stations transmits the second section in time divisional manner after transmitting

the first section at the same time.

7. The communication system as cited in claim 1, wherein:

the clear to send signal is formed to have generally  
5 two sections in which a first section describes at least an  
interval where a third communication station the address of  
which is not described in the request to send signal  
transmitted from said first communication station must stop  
its communication operation, and a second section describes at  
10 least reference information known to said first communication  
station; and

each of said plurality of second communication stations  
transmits the second section at the same time after  
transmitting the first section at the same time.

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8. The communication system as cited in claim 1, wherein:

each of said first communication station and said  
plurality of second communication stations is configured to  
carry out wireless communications.

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9. A communication method for carrying out data  
communication among a plurality of communication stations,  
wherein:

upon a data transmission, a first communication station  
25 transmits a request to send signal for requesting transmission  
to other station, said request to send signal describing at  
least addresses of a plurality of second communication  
stations that are desired to receive the data when receiving  
the request to send signal transmitted from the first  
30 communication station;

each of said plurality of second communication stations

transmits a clear to send signal notifying the completion of preparing the reception; and

said first communication station receives said plurality of clear to send signals transmitted from each of  
5 said plurality of second communication stations.

10. The communication method as cited in claim 9, wherein:

said first communication station has a plurality of antenna elements for a directive antenna;

10 each of said plurality of second communication stations transmit clear to send signals describing at least reference information known to said first communication station; and

said first communication station learns weightings for the directive antenna on the basis of the reference  
15 information in the clear to send signals transmitted from each of said plurality of second communication stations.

11. The communication system as cited in Claim 10, wherein:

20 said first communication station transmits data by the space division multiplexing to each of said second communication stations using said plurality of antenna elements when receiving the clear to send signals transmitted from each of said plurality of the second communication stations; and

25 each of said plurality of second communication stations transmits a response signal which is used to notify that the transmitted data to other stations is correctly received, describes at least second reference information known to the first communication station, and is inherent to said plurality  
30 of second communication stations when receiving the data transmitted from said first communication station.

12. A communication apparatus for transmitting data to other communication stations comprising:

data processing means for generating a request to send  
5 signal requesting transmission to other communication station upon data transmission, and describing at least addresses of a plurality of communication stations requested to receive the data; and

communication means for transmitting the request to  
10 send signal.

13. The communication apparatus as cited in claim 12, wherein:

said communication means receives a plurality of clear  
15 to send signals transmitted from said plurality of communication stations which receives the request to send signal for notifying the completion of preparing the reception to the other communication station.

20 14. The communication apparatus as cited in claim 13, wherein:

said communication means includes a plurality of antenna elements for a directive antenna; and

data processing means learns weightings for the  
25 directive antenna on the basis of the reference information in the clear to send signals transmitted from the plurality of second communication stations.

15. The communication apparatus as cited in claim 14,  
30 wherein:

said data processing means obtains transfer functions

between each of antenna elements of said plurality of second communication stations and each of said plurality of antenna elements thereof on the basis of the reference information in the plurality of the clear to send signals transmitted from  
5 said plurality of second communication stations, and learns the weightings for the directive antenna on the basis of the transfer functions.

16. The communication apparatus as cited in claim 14,  
10 wherein:

said communication means transmits data by the space division multiplexing to each of said plurality of communication stations using said plurality of antenna elements when receiving the clear to send signals transmitted  
15 from each of said plurality of communication stations; and

receives a response signal which is used to notify that the transmitted data to other stations is correctly received, is inherent to the communication station itself, and describes at least second reference information known to the other  
20 communication station when receiving the data transmitted from each of the plurality of communication stations.

17. The communication apparatus as cited in claim 16, wherein:

25 said data processing means directly learns the weightings of the directive antenna on the basis of the second reference information included in the plurality of response signals transmitted from each of the communication stations.

30 18. The communication apparatus as cited in claim 13, wherein:

said communication means receives the clear to send signals transmitted from each of said plurality of communication stations, and describing addresses of these communication stations.

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19. The communication apparatus as cited in claim 13, wherein:

said communication means time-divisionally receives the plurality of clear to send signals time-divisionally  
10 transmitted from each of the plurality of communication stations.

20. The communication apparatus as cited in claim 13, wherein:

15 the clear to send signal is formed to have generally two sections in which a first section describes at least an interval where a communication station the address of which is not described in the request to send signal must stop its communication operation, and a second section describes at  
20 least reference information known to itself; and

said communication means receives in time divisional manner the plurality of second sections transmitted from each of the plurality of communication stations in time divisional manner after receiving at the same time the plurality of first  
25 sections transmitted from each of the plurality of communication stations at the same time.

21. The communication apparatus as cited in claim 13, wherein:

30 the clear to send signal is formed to have generally two sections in which a first section describes at least an

interval where a communication station the address of which is not described in the request to send signal transmitted from said first communication station must stop its communication operation and a second section describes at least reference  
5 information known to itself; and

said communication means receives at the same time the plurality of second sections transmitted from each of the plurality of communication stations at the same time after receiving at the same time the plurality of first sections  
10 transmitted from each of the plurality of communication stations at the same time.

22. A communication apparatus for receiving data transmitted from other communication stations comprising:

15 communication means for receiving a request to send signal requesting transmission to other communication station upon transmission of data by the communication station of a transmission side and describing at least addresses of a plurality of communication stations requested to receive the  
20 data; and

data processing means for generating clear to send signal for notifying the completion of preparing the reception to the communication station of the transmission side.

25 23. The communication apparatus as cited in claim 22, wherein:

the communication station of the transmission side includes a plurality of antenna elements for a directive antenna; and

30 data processing means generates the clear to send signal describing at least a reference information known to



the communication station of the transmission side and used for learning weightings for the directive antenna on the basis of the reference information by the communication station of the transmission side; and

5           the communication means transmits the clear to send signal.

24. The communication apparatus as cited in claim 23, wherein:

10           the data processing means generates a clear to send signal describing at least the reference information capable of obtaining transfer functions between antenna elements of itself and the plurality of antenna elements of the communication station of the transmission side.

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25. The communication apparatus as cited in claim 23, wherein:

          said data processing means, when receiving the data transmitted from the communication station of the transmission  
20 side using a plurality of antenna elements by the space division multiplexing, generates a response signal known to the communication station of the transmission side for notifying the correct reception of transmitted data to the other communication station, and for describing at least a  
25 second reference signal used for directly learning the weightings of the directive antenna by the communication station of the transmission side; and

          said communication means transmits the response signal.

30 26. The communication apparatus as cited in claim 22, wherein:

said data processing means generates the clear to send signal describing at least a self address.

27. The communication apparatus as cited in claim 22,  
5 wherein:

said data processing means time-divisionally transmits the clear to send signals.

28. The communication apparatus as cited in claim 22,  
10 wherein:

said data processing means generates the clear to send signal as to have generally two sections in which a first section describes at least an interval where a communication station the address of which is not described in the request  
15 to send signal must stop its communication operation and a second section describes at least reference information known to the communication station of the transmission side and is used for learning weightings of the directive antenna by the communication station of the transmission side; and

20 said communication means time-divisionally transmits the second section after transmitting at the same time the first section.

29. The communication apparatus as cited in claim 22,  
25 wherein:

said data processing means generates the clear to send signal as to have generally two sections in which a first section describes at least an interval where a communication station the address of which is not described in the request  
30 to send signal must stop its communication operation and a second section describes at least reference information known

to the communication station of the transmission side and is used for learning weightings of the directive antenna by the communication station of the transmission side; and

5       said communication means at the same time transmits the second section after transmitting at the same time the first section.